



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/616,147

07/08/2003

Klaus Kunze

KOV-004

2078

36872 7590 03/12/2007

THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
401 W FALLBROOK AVE STE 204
FRESNO, CA 93711-5835

EXAMINER

TRINH, MICHAEL MANH

ART UNIT

PAPER NUMBER

2822

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
--	-----------	---------------

3 MONTHS

03/12/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/616,147

Applicant(s)

KUNZE ET AL.

Examiner

Michael Trinh

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 41-46, 51, 53-54, 56-65, 96-164 is/are pending in the application.
- 4a) Of the above claim(s) 96-110, 113-124, 126-134 and 139-159 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 41-46, 51, 53, 54, 56-65, 111, 112, 125, 135-138 and 160-164 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

Art Unit: 2822

DETAILED ACTION

*** This office action is in response to Applicant's Amendment filed December 08, 2006.

Claims 41-46, 51, 53-54, 56-65, 96-164 are pending, in which claims 96-164 have been newly added.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Election/Restrictions

1. Newly added claims 96-164 are directed to a plurality of the patentably distinct species of the claimed invention. Generic base claim 41 is amended to recite the semiconductor film comprising an array of lines having a width, a length, and a thickness. Since applicant has received an action on the merits for the originally presented invention at least of subject matter of inkjet printing (e.g. claim 56) and both of first and second cyclic (e.g. claim 45), including the species of having an array of lines having a width, a length, and a thickness as recited in base claim 41, in which generic base claim 1 is amended to recite the array of lines having a dimension of a width of from 100nm to 100 μ m, a length of from 1-5000 μ m, and a thickness of from 0.01-1000 μ m. Species as recited in newly added claims 160-164 and claims 111-112, 125, 135-138, 160-164 for dimensions, inkjet printing, first and second cyclic have been constructively elected by original presentation, together with currently presentation in base generic claim 41 having semiconductor film comprising an array of lines having a width, a length, and a thickness, and examination for prosecution on the merits. Other species as recited in remaining claims including 96-110, 113-124, 126-134, 139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03. Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention. Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to *additional species which are written in dependent form or otherwise include all the limitations of an allowed generic*

Art Unit: 2822

claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Accordingly, Claims 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b).

Claim Rejections - 35 USC § 103

2. Claims 41-46,56-61,62-65,111-112,125,160-164, are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632) taken with Kim et al (6,355,198) and Jacobson (6,294,401).

Shiho teaches (at paragraphs 38-93) a method for making a semiconductor film comprising at least the steps of: a) printing a composition by inkjet printing, offset printing, screen printing (paragraph 0110) to form the composition comprising a first cyclic Group IVA compound of the formula Si_nR_m , n is an integer of 3 or more and m is integer of $2n+2$, wherein $\text{Si}_n\text{H}_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82, which is corresponding to claimed formula (1): $(\text{AH}_x)_n$, where n is from 3 to 8 and each A in the formula is independently Si, and/or a second cyclic Group IVA compound of the formula (2): $(\text{AH}_x)_m(\text{AH}_y\text{R}_z)_p(\text{ZR}')_q$, (2) where $(m+p+q)$ is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of $(y+z)$ is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, aryl, aralkyl, a halogen, $\text{BH}_s\text{R}^{2-s}$, $\text{PH}_s\text{R}^{2-s}$, AsHR^{2-s} or $\text{AH}_t\text{R}^{3-t}$, where s is 0 to 2, t is 0 to 3, and R'' is alkyl, aryl, aralkyl, a halogen, or AH_3 , and a solvent (paragraphs 0102-0103) in a film on a substrate; and b) curing said printed composition to form said semiconductor film (paragraphs 117,120,137,138), wherein curing the printed composition comprises irradiating the printed composition (paragraphs 138,,113,137,120), wherein the semiconductor film comprising a film particularly preferably having a thickness of 0.01 to 5 microns (paragraphs 0110). Re claims 42-44, wherein the composition comprises semiconductor

Art Unit: 2822

silicon nanoparticles (paragraphs 60-64) and passivated as the silicon particles are dispersed in the silane composition. Re claims 45,111-112, wherein the composition including both first and second cyclic group IVA compound of silicon and dopants of B, P, As (at paragraphs 38-93), herein $\text{Si}_n\text{H}_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82. Re claims 46,58 wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film (paragraphs 117,120,137-138), wherein curing comprises irradiating the composition (paragraphs 120,138). Re claims 58-59, 125, wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film at a temperature at least about 200°C (paragraphs 117,120,137-138), wherein sintering temperature is at least about 300°C (paragraphs 117,120,137-138). Re claims 60-61, wherein the curing heat treatment is evacuated so as to treat in an inert argon gas or reducing hydrogen gas in chamber, inherently (paragraphs 117, 137).

Re claim 41, Shiho already teaches inkjet printing a semiconductor film having a thickness, particularly preferably of 0.01 to $5\mu\text{m}$ (paragraph 0110), while claim 41 recites an array of lines having a width of from 100nm to $100\mu\text{m}$, a length of from 1 to $5000\mu\text{m}$, and a thickness of from 0.01 to $1000\mu\text{m}$, and lacks forming the semiconductor film as a patterned semiconductor film by gravure printing.

However, , Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from $1\mu\text{m}$ to $10\mu\text{m}$, a length of from $100\mu\text{m}$, and a thickness as similar to a width and spacing of from $1\mu\text{m}$ to $10\mu\text{m}$ (re further claims 41,62-65,160-164). Jacobson teaches (at col 5, lines 34-60; col 3, lines 36-43) printing semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, etc, wherein the patterned semiconductor film is used in forming a thin film transistor, wherein printing by ink jetting the composition with solvent (re further claim 56, col 5, lines 34-45, col 6, lines 1-10; col 4, lines 13-15), wherein by screen printing process, the composition with solvent is inherently deposited on the substrate through stencil on or over the substrate, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography (re claim 57).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as an array of lines of a patterned

semiconductor film having a typical width of from 1 μ m to 10 μ m, a length of from 100 μ m, and a thickness as similar to a width of from 1 μ m to 10 μ m by inkjet printing, gravure printing, offset printing, as taught by Kim and Shiho above. This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as a patterned semiconductor film by inkjet printing, Gravure printing, offset printing, screen printing, spin coating, etc., as taught by Jacobson and Shiho above. This is because of the desirability to form patterned semiconductor films on desired and selected portions of the substrate in forming a plurality of semiconductor thin film transistors by using a variety of printing processes.

The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness, as taught by Kim and Shiho, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

3. Claims 51,53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Kim et al (6,355,198) and Jacobson (6,294,401), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Tani et al (5,254,439).

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above. Jacobson teaches (at col 5, lines 34-60; col 3, lines 36-43) printing a composition of semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography. Shiho also

Art Unit: 2822

teaches (at paragraph 110) depositing the composition by inkjet printing, spray coating, spin coating, and irradiating the composition with an ultraviolet light (paragraph 138).

Shiho thus lacks selectively irradiating the composition through a mask (claims 51-54)

However, Tani teaches (at Figs 2,3; col 5, line 60 through col 6) selectively irradiating the layer through a mask aligned on substrate as marked, and removing a portion of the layer after irradiating in order to form a plurality of patterned layers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to pattern the semiconductor film of the references including Shiho and Jacobson by selectively irradiating through a mask and removing a portion of the layer as taught by Tani. This is because these patterning techniques are alternative and art recognized equivalent for substitution in forming distinct patterned semiconductor films on the substrate so as a plurality of semiconductor thin film transistors can be fabricated at the same time.

4. Claims 135-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Kim et al (6,355,198) and Jacobson (6,294,401), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Korgel (2003/0034486)

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above.

Shiho already teaches (at paragraphs 0061-0062) forming silicon particles having a diameter of from 0.005 micron (5 nm as 1 micron equals to 1000nm), while claims 135-138 recites silicon particles having an average diameter of less than 5 nm or 3.5 nm.

However, Korgel teaches (at col 15, lines 12-30) forming silicon particles comprising nano-particles having an average diameter of about 5 nm, 3.5 nm, or 2 nm.

The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of average diameter of silicon particles, as taught by Korgel, which is within the range of applicant's claims, because of the desirability to form silicon nanoparticles for forming very small devices, and because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by

Art Unit: 2822

routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Response to Amendment

5. Applicant's remarks with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Oacs-21



Michael Trinh
Primary Examiner